Leigh (E)

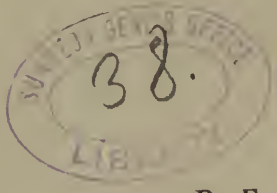
THE

PHILOSOPHY OF MEDICAL SCIENCE,

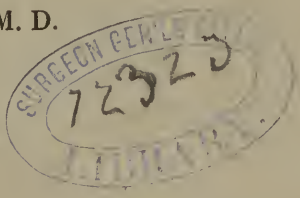
CONSIDERED WITH SPECIAL REFERENCE TO DR. ELISHA BARTLETT'S "ESSAY ON THE PHILOSOPHY OF MEDICAL SCIENCE."

A BOYLSTON PRIZE ESSAY, 1849.

"I *fear* he has got hold of his pitcher by the *wrong* handle."
Altered from J. J. BECCHER, *as quoted by* DR. BARTLETT.



BY E. LEIGH, M. D.



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It may be proper to state, that the Committee of the Boylston Medical Society, in awarding a prize to this Essay, have, of course, expressed no opinion respecting the views contained in it; for these, the writer only is responsible.

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THE PHILOSOPHY OF MEDICAL SCIENCE.

We can hardly place too high an estimate upon the value of a sound philosophy of medical science. No one will deny this statement. Even those who contend most earnestly for "observation" and the strictest adherence to facts, will give to it their full assent. Though they will have no philosophy *in* science, they will insist upon their peculiar philosophy *of* science.

Indeed it is most obvious that the very shape the science will assume in the mind of the physician, or in the treatise of the medical writer, will be conformed to his views of its true nature and proper elements; so that, to the mature scientific physician, a sound philosophy of his science is of fundamental importance.

To the student in medicine, also, it is of no less consequence. The whole character and course of his studies will be shaped by it. Indeed *some* philosophy of science, either true or false, he *will* have, for no mind can be employed in the study of science without it. And a sound philosophy he will need, and will feel the need of at the outset, if he has had any experience in the study of other sciences. He will wish to know what he has before him. He will wish to have some general idea of the ground upon which he is about to tread. He will desire to ascend some eminence from which he can take a general survey of the country he is about to explore, and learn something of its general character and prominent features, before he descends to examine it in detail. In this way he will be prepared to proceed in the right direction, to make the most rapid progress, and prosecute his investigations in the wisest and most successful manner.

The very title, therefore, of Dr. Bartlett's work* will at once attract the attention of the scientific physician, and of the reflecting student. The volume itself he will find to be one, in which he must necessarily take a deep interest. The perusal of it cannot fail to afford him plea-

* The Philosophy of Medical Science. By Elisha Bartlett, M.D. Philadelphia, 1844.

sure, to give him valuable instruction, and furnish him food for thought. There is a charm in the style in which it is written, a beauty and freshness about it, a clearness, precision and vigor in its language, that is truly refreshing as we turn to it from our ordinary medical reading. There is a sincerity and earnestness in the author's manner, an ardent devotion to the cause he has espoused, that at once takes captive the mind of the reader. Moreover, the error he is combating, the error of substituting mere theories, hypotheses, assumptions and speculations in the place of facts and truth, is one of the gravest character—one which has exerted a pernicious influence upon our science from the earliest ages—one which is venerable for its antiquity, and carries with it the influence of great and honored names, and still maintains a strong hold upon the minds of men, though some of its more prominent developments are of recent date, and are only looked upon with ridicule or contempt. The cause he has espoused, the cause of fact and truth against theory and false doctrines, the cause of observation against speculative fancies, of true science against science falsely so called, must ever enlist the sympathies and engage the attention of truly scientific minds. He has done his work, too, in many respects, in such a masterly manner, that we involuntarily entertain for him more than the respect which his professional standing and reputation would demand; we feel that we are sitting at the feet of a master in science.

But with all our admiration of the author's abilities, of the vigor of thought, and beauty and freshness of style which his work exhibits, with all our sympathy with the cause he has espoused, with all our readiness to unite with him in excluding from the domain of science all speculative fancies, and unfounded assumptions, we cannot receive the philosophy he has thought necessary to adopt in order to secure this end. It is not the true philosophy which fact and reason teach.

The common idea of the philosophy of science is doubtless the true one. In accordance with this idea of it, science embraces,

I. Certain *Primary Truths*, or fundamental principles, upon which all its reasonings are based. These belong to each of the sciences in common with all the others. Two of the more important, only, need be mentioned here. One is the "principle or law of causation," that "every beginning or change of existence has a cause." The other is "the principle or law of uniformity," that "matter and mind have uniform and fixed laws," that "all the processes of nature take place in accordance with uniform and permanent laws."

II. Science embraces also certain *ascertained and classified Facts* (or, as Dr. Bartlett calls them, phenomena and their relationships), some

of them ascertained by observation directly—others ascertained by reasoning from previously known facts and established principles.

III. But, above all, science embraces certain *General Ideas, Truths* and *Principles*, which the thinking, reasoning mind arrives at by studying the facts that have been ascertained and classified.

Of these threefold elements does science, absolute science, consist. Take away the first, the primary truths, and the whole fabric of science is overthrown, its observations and its reasoning are worthless, its facts and its truths are gone. Take away the second, the facts, and there are no means of arriving at its truths, the whole structure and its very materials are wanting, there is nothing to be seen but the everlasting foundations. Take away the third, the truths and ideas of science, and you leave the solid foundations, surrounded by a rich supply of well-selected and well-assorted materials; but the noble structure, the beautiful living temple of science, is not there.

The second class of these threefold elements—the facts—are often, in themselves considered, of great interest and importance. But their chief value lies in the truths and general principles to which they direct the mind, and which can be fairly deduced from them. It is in these general ideas, these scientific truths, these large and comprehensive principles, that science especially consists. Take them away, and you leave only a mere naked skeleton of material facts, beautifully formed and arranged, perhaps, but lifeless, powerless, inert. It is the mind, in the exercise of its higher powers, that gives to facts their significance, and, by working among them and upon them after they have been collected and arranged, draws forth and holds up to view those ideas, truths and principles, which constitute science in its highest and noblest sense, and make it the living, efficient, all-pervading thing it is.

But the philosophy of the work which has been referred to, in its attempt to banish theories and speculations from science, has left no place for its truths and principles; it has at once taken away the foundations and removed the superstructure, leaving only a limited collection of well-arranged, and well-classified materials. It admits into science nothing but "observed facts." No other fact however clearly proved, no idea of science however clearly discerned, no principle of science however well established, no scientific truth however well known, no doctrine however sound, can gain admittance. Nothing can enter but mere facts; and each of these must enter by itself, through one of the five senses; and then poor pitiable reason is allowed to look at it, see what it looks like, and put it in its place by the side of others like it—that is all! This is absolutely all the author allows science to consist of. He makes it a

mere cabinet of such dead material facts as the five senses are able to pick up on the surface of things.

Such a philosophy he never could have dreamed of, had he not been, either misled by the dogmas of the grossest materialism ; or, what is more probable, blinded by his ardor to demolish speculative theories. As it is, he has set up an hypothesis against all hypotheses ; a theory against all theories ; an assumption against all assumptions ; a mere speculation against all speculations ; a false doctrine by which to annihilate all other false doctrines. For such in reality is his philosophy ; it is hypothesis, theory, assumption, speculation, false doctrine. His leading doctrine, "that all science consists exclusively in phenomena and their relationships classified and arranged," is so far from consisting of "phenomena and their relationships," that it is not even based upon them, or deduced from them ; it is neither the result of observation nor the deduction of reason ; but is a mere assumption, a speculative doctrine contrary to both.

The term "relationship" which he uses, if understood in its widest sense, might, perhaps, include the truths and principles of science. But he does not permit us so to understand him. He is too great a master of perspicuous language for that. Indeed, for him thus to use the word, would be, to defeat his own object, and to leave open the very loop-hole for the entrance of speculative theories into science, which he is so anxious to close. But he himself tells us his meaning clearly. Throughout his work he expressly excludes all truths and principles from science, endeavoring to reduce them all to the category of *phenomena*. Besides, all his relationships are *observed* relationships ; and, as appears from his remarks upon marble (pp. 12–16), are only phenomena of a particular kind, compound phenomena—phenomena observed between related substances, such phenomena as are observed when sulphuric acid acts upon marble, or a piece of marble falls to the ground. The facts observed respecting the "sensible properties" and "intimate composition" of this substance, he calls its "phenomena ;" and the facts observed in regard to its geographical and geological distribution, and when it is brought into chemical and physical relations to other substances, he calls "relationships." Here, his phenomena are what is observed in the marble itself, when examined alone, apart from other things ; and his relationships are the phenomena observed when the marble is considered in connection with and acting upon other objects. They are, after all, only observed facts or phenomena. Indeed when speaking (p. 25) of the "phenomena or relationships" of polarized light, he makes the two words synonymous. But whatever he may mean by "relationships," he means

something that is observed, and he does *not* mean any truths or principles that the mind acquires by thinking and reasoning upon and studying those facts which have been ascertained and classified. And inasmuch as all his relationships thus appear to be phenomena, and the word phenomenon in itself signifies something that appears, something that is observed—the two words, "observed," and "relationship," in his statement of his principles are superfluous, and his theory may be reduced to this simple form—"All science consists exclusively in phenomena."

But such an examination of the author's expressions is perhaps unnecessary. The language in which he states his theory is so clear, so precise, so positive, so often repeated, that it is impossible to mistake his meaning. The favoring eye of a friend, admiring his peculiar excellencies and approving his general object without strictly scrutinizing the method by which he has sought to secure it, might perhaps overlook this at first. But even that friendly eye on being directed to this point, could not fail to see it through the transparent language of the author, lying there, as it does, in all the distinctness of outline which his clear intellect has given it.

The following are some of his strong and clear statements of his theory.

After referring (page 7) to the "common feeling" that facts do not constitute the whole science, but are only the foundation—the basis—upon which it rests, or the materials of which it is constructed, he affirms, on the contrary, that "The science *is in the facts and their relationships classified and arranged, and in nothing else.*" They "constitute in themselves and alone the science and the whole science to which they belong. The science, thus constituted, is, so far, complete. No process of inductive reasoning or any other reasoning, no act of the mind, can add anything to what has already been done. The only reasoning that has anything to do with the matter consists simply in the act of arranging and classifying the phenomena and their relationships, according to their differences, their resemblances, or their identity." He says of the phenomena of gravitation (p. 9), They *are* the science *in themselves, wholly and absolutely.* When all the phenomena "have been ascertained and classified, the science is complete; it is finished; there is nothing more to be done, nothing can be added to it by any subsequent process of reasoning or act of the mind."

With this language, and this theory, contrast the following language of Professor Agassiz. As the lecture* in which it occurs has never been

* Delivered before the Tremont Medical School.

published, this passage of the report of it has been shown to him, and has received his full assent as expressing his views. Indeed it is undoubtedly a strictly verbatim report of the words spoken by him, and it is only one instance of many in which he has expressed the same views. He says :—

"But how are we to proceed to trace a law? to investigate general views from isolated facts? It is an operation which has many and great difficulties. Trace isolated facts, and from isolated facts arrive at ideas. Derive thoughts from facts. From actual facts, from material things, derive thoughts. That is the condition; that is the aim, which we should have before our minds. Form thoughts from material facts, and form new thoughts from the combination of well-known facts, and constantly improve in our thoughts, by investigating the same long-known facts. It is not simply by adding new facts to the stock of knowledge, which we already possess, that we improve in our knowledge. From well-known facts, from generally-known facts, from facts which are known to everybody, there is new knowledge to be derived, provided we think deep enough, and we think high enough of what we see, to deduce something new from old, well-known things."

It would seem unnecessary to go further after such an expression of his views by Professor Agassiz. He tells us, not that the science is in the facts, that they constitute in themselves the whole of it, that all that reason has to do is to arrange the phenomena, that no reasoning, no act of the mind can add anything to the arranged facts; but he tells us that there are *general views* to be sought and proved by investigation, that there are *ideas* to be arrived at, that there are *thoughts* to be derived from the facts, and that this should be our great *aim*—to form *thoughts* from material facts—and to *improve* in our thoughts by investigating—that there is *new knowledge* to be derived from facts which have been long known and classified, by *thinking deep* and *thinking high*, and that by such thinking we may *deduce something new* from them.

Here certainly is something more than facts, and more excellent than they. Here is something of a higher nature added to the facts, by the thinking mind. Here is work, and noble work for the mind to engage in among the classified facts. This is the true view of the philosophy of science, and is one worthy of its elevated character, and of the glorious faculties of the soul which are employed upon it. The authority of Professor Agassiz upon such a question cannot be disputed. So far as authority goes, none higher can be found. We have here all that can be desired in the opinion of one who has done most for science,

who has drunk most deeply of its spirit, who is most thoroughly imbued with its true philosophy.

But let us examine some points in Dr. Bartlett's theory more in detail.

1. As already noticed, it excludes from science all its fundamental principles, or primary truths. There can be no doubt that he excludes them. They are not phenomena, they are not even generalized phenomena; nay, more, they are not even the deductions of reason from ascertained phenomena. They are primary truths lying at the foundation of all reasoning and observation. They are truths discerned by the mind in the exercise of its higher powers of "original suggestion," as Reid, Stewart, Brown, and some of our most distinguished American philosophers, express it; or of the "pure reason," as Kant, Cousin, and the Continental philosophers generally, and Coleridge, and some American philosophers, express it. Cudworth and Locke expressed the same view, in other words, though it is not in accordance with the leading views of Locke's philosophy. However much philosophers may differ on other points, whatever obscurity and mist may hang over other parts of their philosophy, however wild many of their speculations may be; on this point, viz., that these "primary truths," together with certain "primitive ideas," are not observed by the senses, and are not deduced by the reasoning power, but are directly discerned by the mind in the use of an intellectual vision which it has for such truth, in the exercise of its higher power of intuitive perception, or original suggestion—that the pure reason has an eye that can see them directly, the moment they are brought within the range of its vision—on *this* point they are all agreed, they are all clear and definite in their statements, and their views receive the ready assent of sound, thinking minds. It is only such philosophers as Hobbes, Hume, Gassendi, Mill and Compte, and Condillac, who hold a contrary opinion. Now all such primary truths, which are not observed phenomena, which are not phenomena in any sense, are, of course, excluded from science by Dr. Bartlett's theory.

But, inasmuch as he has referred to some of these truths (pp. 26 and 79), to the principle that "every change has a cause"; that everything peculiar in the cause involves a corresponding peculiarity in the effect; that everything peculiar in the effect, implies a corresponding peculiarity in the cause; and that the phenomena and processes of nature are uniform and invariable; since he has referred to these fundamental principles, and admitted them as "universal and necessary,"* and seems

* His remark in this connection (p. 27), that "all exceptions to this invariableness and uniformity are apparent only, and not real," is a very just one. But his subsequent remark, "that the old saying, so constantly and blindly repeated, 'that the exception proves the rule,' is as desti-

to regard them as antecedent to science and essential to it, but not included in it, we will not dispute this point with him. If he chooses to use the term "science" in a more limited sense, as embracing only the phenomena observed, and the facts and truths and ideas arrived at by the thinking, reasoning mind, by the aid of these phenomena, and these primary truths, so be it.

Still, these fundamental principles, being essential to science, being inseparably connected with all its observations and all its reasoning, it would seem most fitting, in a broad and comprehensive view of the philosophy of science, to include them among its proper and essential elements, as elements so essential, that without them science could not exist. Geometry does not discard its axioms, why then should the science of life discard its fundamental principles.

But we cannot consent to go farther, and limit science to mere phenomena, banishing all facts proved by reasoning, and all the ideas, truths and principles which constitute its higher elements.

This leads to the second point, that

II. Dr. Bartlett's theory excludes all those facts which are not observed directly, but are proved and conclusively proved by reasoning; and moreover leaves no room for the employment of the reasoning faculty.

This lies on the very face of his theory, being one of its principal features. He maintains expressly that no fact in science can be proved by reasoning, but must be observed by itself if known at all. His proposition is, that "these facts, phenomena and events, with their relations, can be ascertained only in one way, and that is, by observation, or experience. They cannot be deduced or inferred from any other facts, phenomena, events or relationships, by any process of reasoning, independent of observation or experience." He says, again (p. 17), "Each distinct and peculiar relationship can be ascertained in one only way, by one only method, that of observation of the relationship itself." In other places (pp. 10, 75, 76), he maintains, that "Each separate class or series of phenomena or relationship must be observed by itself," "that a knowledge of one class cannot be deduced or inferred from the knowledge of any other class, by any process of reasoning."

Now there can be no doubt that there are some facts which cannot

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tute of truth as it is of meaning," is *not* just. The "exception," though only apparent, does prove the rule. Did not the rule exist, the exception would never be made, would never be thought of. Were there no true coin, there never would be counterfeits. Counterfeits prove the existence of true coin. Exceptions (though apparent only) prove the rule. Viewed in this, its true light, the old proverb is full of significance.

be proved by certain other particular facts. He has cited a large number of such instances. And this is the only proof he has brought, of the correctness of this part of his theory. He has shown conclusively that some facts cannot be proved from *some* other facts; as, for instance, that the structure of the heart does not show the nature of the blood (p. 81 at bottom) ; and that is all he has shown.

But in the preceding and in many similar statements of his theory on this point, he means more than this, though he has proved no more.

He starts with the idea, that there are certain classes or series of things so like each other, that in observing one or one hundred of them, you actually observe the whole series at once ; that each and all the individual facts in the series are observed in a lump in that one observation. Exactly as certain theologians are supposed to have believed, and perhaps some of them did believe, that each and all the individuals of the human race sinned together in that one sin of Adam. The cases are exactly parallel on the point in question, and one is just about as true as the other. However, assuming this idea (for it is a mere assumption), our author is able to bend the facts of nature to his theory, by which, in order to exclude speculation, he would exclude all reasoning from science, and allow the mind only to observe phenomena, to see their resemblances, and differences, and put those which are alike together in proper order, in all which no true process of reasoning is involved. He does not take the true view of the case, that by means of a certain number of classified phenomena, the human mind in the exercise of its reasoning faculty, and by a genuine process of reasoning—of true inductive reasoning, from particulars to the general truth—is enabled to ascend from the material facts to the truth, the general truth implied in those facts and proved by them, though it embraces all other similar facts which are yet unobserved ; and then, from this general truth thus proved by reasoning, the mind descends again by a genuine process of reasoning, though in a reverse direction, from the general truth to the particular fact, and can arrive at any one of the facts coming under that general truth, if necessary. Such a fact thus known, is a proved fact, not an observed one, and this is the character of the body of facts known to science ; it is comparatively very few of them that have been observed—or rather, science chiefly consists in the general truths, which have been proved, and are ready to be applied to any particular fact when needed.

Instead of taking this correct view of the case, our author has chosen, in consistency with his theory of "observation," to scatter to the winds all these reasoning processes and their results, to banish from science those truths and principles in which its glory and life and power and

practical value consist, and reduce the whole to an act of observation, an act of seeing a whole class of facts at once, while looking at one of them. But this idea is an absurd one. We may indeed know a particular fact on finding it to be a logical consequence of a general truth proved from some other fact; but we do not observe the one in the other. Just as a man (to extend our theological illustration) may commit sin in consequence of a general course of things, resulting from a previous sin of another person, as of Adam; but he does not sin in the sin of that person, he must sin himself if he sin at all. And a phenomenon must be observed itself, if it be observed at all.

The facts, however, that we are now considering, are not observed in any way; they are proved by a regular course of reasoning, and in every case the mind must pass through this course of reasoning, even though it dart through it with the rapidity of the lightning's flash. Genius, even, is not freed from this law. Goethe and Newton were obliged to arrive at truth by this method. A single fact, it is true, was sufficient for them, where a hundred would be needed by a common mind. With the keen eye of genius they were able to discern the truth when millions of facts had not revealed it to inferior minds. And probably they arrived at it in a moment. The reasoning process was gone through by their minds in an instant, though for the first time, as rapidly and with as great facility as the mind of the most rapid pianist passes through its processes after having gone over them a thousand times. When Newton saw the apple fall, when Goethe saw the vertebrate form in the skull of the deer—the law of gravitation, and the law of the structure of vertebrated animals, may have flashed into their minds in an instant. But the law of uniformity was the conductor by which the electric truth entered. There is a powerful attraction between such minds and truth; but the dazzling splendor of its instantaneous and brilliant results, should not blind our eyes to the mode in which the results are obtained. Their minds must move along the road which God has created for every mind to move in. They must pass through the inductive process, they must go in the path through which the law of uniformity leads them. The same process which other minds have gone through, to confirm their results, that same process their minds went through when they first attained them. The truth was then proved to their minds by reasoning, though even *they* did not dare to place it in the temple of science, till they had confirmed their result by many and varied repetitions of the same reasoning process. And they having led the way, thousands of minds have followed in their footsteps, each for itself verifying their results.

But to return to the theory of our author. While he, in his peculiar way, admits that all the facts of any one class may be ascertained, from the actual observation of a few of them, he denies that the facts of any other class can be thus ascertained without being specially observed by themselves. "Each class of phenomena can be ascertained only by direct observation of the phenomena themselves." Physiology cannot be deduced from anatomy—nor can pathology be deduced from physiology —nor can we ascend thence to therapeutics. Each class of facts must be observed by itself. Nay, each particular species of facts in each of these several departments must be observed separately. When we get down to those lower classes, those particular species of facts which are so exactly alike, that in seeing one we see all, something may be done. But above this, our previous observation is of no avail in aiding us to arrive at any knowledge of facts which have not yet come under our eye.

But, while each particular species of fact has its peculiarities, are there not also resemblances between the different species which enable us to arrange them in various genera? and these genera again, in various orders? and so on up to wider, more general, more comprehensive divisions? And is not here a sufficient foundation for reasoning from one class to another? Are there not also relations of cause and effect which enable us to reason in another way from one class to another?

It is not denied that there must be special observations in each department of our science, and in each class of facts, some to confirm the results of our reasoning (which must always be done where it is possible), and others to ascertain facts that reasoning cannot reach. Each class of facts has its peculiarities which require separate observation, unless we can reach them by reasoning from cause to effect, and *vice versa*. But there are such relations between the different classes of facts, and between the several departments of our science, that our knowledge of one department is in a great degree dependent upon our knowledge of the others, and much of our knowledge could never be attained in any other way. It is useless to follow our author through his long array of facts and argument on this point. It does not reach the question. Because some things cannot be proved from a particular class of facts, it does not follow that nothing can be proved from it. It is also useless to cite many instances. They are innumerable, and only a few obvious ones need be alluded to.

Any one who has read the late investigations into the minute structure of the kidneys—of the manner, for instance, in which the tubuli uriniferæ

and the bloodvessels come together in those wonderful corpuscles of Malpighi, should be slow to admit that nothing has been thereby added to our knowledge of the functions of that organ, even though the precise mode in which urine is secreted there, and the reason why urine rather than bile or any other fluid is secreted, is not known, and very likely never will be. But setting *this* aside, does our knowledge of the function of the kidney in no measure depend upon our knowledge of its anatomical relations? and upon its similarity in structure to other secreting organs? Take this anatomical knowledge away from us, and what should we know of the functions of this organ? By the aid of these anatomical facts we know that it *must* be the organ that secretes urine, and not the bladder or the ureters, or the supra-renal capsules. By reasoning from these facts, we know that the urine must be secreted in the kidney; but we never caught that organ in the act. No eye ever saw it in the exercise of its function. The well-known fact in regard to the proper function of this organ is a proved fact, and not an observed fact. The same is true of other organs.

Even where we can see an organ in the exercise of its peculiar function, it is probable that our knowledge of it depends chiefly upon reasoning from its anatomical structure and relations. We know more and understand more of the function of the heart from our knowledge of its anatomy, than we do from its thumping against the walls of the chest, from the beating of the pulse, or the spouting of the divided arteries. And even those of us who have looked upon its curious movement, as seen in the opened thorax of a living animal, know very little more of its function than those who never saw it. Though, as our author says, the structure of the heart throws no light upon the nature of the blood, it does throw a flood of light upon the character and mode of its own function. But perhaps we get a little light respecting the functions of the blood, from another source, from its own structure or constitution as revealed by the microscope and by chemical rëagents.

Not to enter further into particulars, what should we know of the functions of the vesiculæ seminales, of the olfactory lobes, of the different parts of the internal ear, of the corpora quadrigemina, indeed of almost every organ or part of an organ in the body, if our knowledge of their anatomical structure and relations were taken from us. Is it not true that a large portion of the whole circle of our physiological knowledge is more or less dependent upon anatomy and reasoning, instead of being, as our author maintains, absolutely and entirely independent of both. He has taken the wrong view of the matter, he has "got hold of his pitcher by the wrong handle." In regard to therapeutics, it would be easy to show

that the treatment of disease by our wisest and best physicians depends in a very great measure upon reasoning from cause to effect. There is very little specific treatment in the whole round of practice.

With reference to his exclusion of reasoning from science, it may be asked, what becomes of the method of reasoning by exclusion, by which we ascertain the character of a particular tumor, for example, by determining that it is not this, or that, or the other kind, thus excluding, one after another, the various forms of this disease, till we get to the right one, and thence arrive at the conclusion that it must be that particular form of tumor, because it can be no other. This is legitimate reasoning, and is in constant use. But is the fact thus arrived at, an *observed* fact? If so, it must be observed by *not observing!*—"*lucus a non lucendo.*"

It will be noticed that (pp. 79 and 87) the author has felt obliged to refer to the aid we derive in science from the "law of uniformity," and the "law of causation." But in doing this, he does not modify his theory, or recede from his position, "that the only reasoning there is in science consists simply in the act of arranging and classifying." This is strange enough. Will the author tell us what process of reasoning there is that does not consist in the application of such laws as these, or some modification of them, to the facts of science? He has thus unintentionally, and contrary to his theory, admitted into science all the known processes of reasoning.

Let the mind take these laws and with them walk forth among the facts of science, and it will have work enough to do, and room enough and opportunity enough for the full exercise of all its reasoning powers. The author has admitted here all that could be asked, if he will only carry out his admissions to their full extent, and modify or remodel his philosophy so as to give reason its full scope and proper place in science, and allow it to bring with it all those facts, truths, and principles, which cannot be observed, though they can be most conclusively proved. Of the power of reasoning, it has been well said that it "appears to have been given us in compassion to our weakness, that we may acquire knowledge which otherwise would not be within our reach. It brings to light the great principles and hidden truths of nature, it gives grand and comprehensive views which could not otherwise be obtained, and invests men and external things and events, in their origin and in their consequences, with a new character."

III. But the great vice of this theory is, that it excludes from science all its ideas, thoughts, truths and principles, leaving nothing but an array of lifeless material facts.

The author notices the common belief that there are general laws and principles in science, and tries to make them bend to his theory, by calling them "generalized phenomena," and making them only a peculiar kind of phenomena; a sort of general phenomena, which are observed, when one or two of the particular phenomena are observed—a sort of "original sin," which comes into being the moment the first particular act of sin is committed, and at once extends to all the individuals of the race. He says (p. 29) his "object is to show that all laws or principles of science consist merely in these constant and invariable phenomena and relationships." He says truly enough that a law is not a power lying back of the phenomena; but he does not say, what is equally true, that a law is a general truth proved by the facts, and not a general phenomenon observed in the facts. He says (p. 148), "a law is not an element superadded to the facts by an act of reasoning, it *consists in the phenomena* and their relationships, and is *identical* with them." "The law or principle [p. 175] is not a creature of the reason"; "it does *not* consist in any intellectual deduction, as it is termed, from the phenomena." "There are no principles [p. 220] which have any legitimate right to this character, excepting those which *consist exclusively in* these *details* themselves."

It is not necessary to argue this point here. It has already been sufficiently considered incidentally in other connections. Besides, if any mind does not of itself perceive that a general truth of science is something different from the phenomena and details themselves, and of a far higher and nobler character, argument will do that mind no good; and if it does perceive this, argument is superfluous. Professor Agassiz, in the passage already quoted, speaks of ideas, thoughts, and general views deduced from facts; and in another place he has said, "it is not sufficient to know what the facts are, it is our task to *understand* them"; and in another place, he says, it is his object "to show how to investigate isolated facts, and to *deduce general conclusions* from them; how to arrive at general views from the actual study."

And though this point is so important, it will only be necessary to add to what has already been said, that there are in science general *ideas*, arrived at by the mind by the study of collected and arranged facts; as the idea of a vertebra. This is not a *vertebra*, nor a whole collection of vertebræ, nor anything observed, but an *idea* arrived at by the mind after comparing a whole series of arranged and classified vertebræ, and studying and thinking upon them.

Then there are general *truths*, deduced by reasoning from particular facts; as the truth that the whole bony skeleton of man is constructed

on the plan of a series of vertebræ; the truth that the wing of birds, and the fin of fishes, are constructed on the same plan with the human arm.

Then there are other truths, more general, more comprehensive, deduced from the lower classes of truths; a sort of *genera* and *orders* of truths, deduced from a comparison and study of all the *species* of truth; as this, that all vertebrated animals are constructed upon the plan of a series of vertebræ variously modified and developed; till we arrive at the still more comprehensive truth that the whole animal kingdom is constructed upon one great plan, variously modified and applied to the exigencies of each particular division, order, genus and species, with admirable skill and wonderful intelligence. Now, to call these scientific truths, the details themselves—to make them identical with the observed phenomena, is too ridiculous to admit of the seriousness of argument.

Having now considered this theory of science somewhat in detail, it may be well to notice one or two applications of it which the author has made.

He says (p. 219, &c.) "it is the diligent searcher after facts who makes the acceptable offering on the altar of science; that the question is, What have you done? What have you seen? What new phenomena and relationships have you discovered? or, What old one have you rendered more intelligible and positive than it was before?" If we do anything for science, we must do it by discovering new phenomena, and making clearer and more positive the old ones (or else by "pointing out the only true method of reaching this knowledge"—that is, by framing a Philosophy of Science). He says, "the *fact-hunter*, as he has been sneeringly called, provided he is only a *fact-finder*, and a *fact-analyzer*, is the only true contributor to the advancement and the improvement of medical science." And what he means by *analyzing* facts, he has already told us; it is merely to look at them, see their resemblances and differences, and put like and like together.

Now I will only contrast with this, another passage from Prof. Agassiz.

He says, "Making discoveries has been the object envied by all those who have devoted themselves to science. But I think the time is past when it was desirable for any scientific man to make discoveries." "The names of the great men in science are never connected with discoveries"; and he refers to Cuvier and Humboldt, as instances. "They," he says, "have traced phenomena, and followed up their results, and that is why their results are so important, and why they have obtained such an influence upon science." As he said in the passage before quoted, they "took the old facts already known, and compared them,

and studied them, and *reasoned* upon them, and *thought* deep and thought high, till they had *deduced* new knowledge from them, till they had arrived at great ideas, thoughts, general truths, which have renovated science, and given it a new aspect." No doubt making discoveries is an excellent and important method of improving science; but it is by no means the only method, and taking it as recommended in connection with this theory, it is certainly a very inferior one. There is a more excellent way, which the distinguished naturalist referred to has taught and exemplified.

Our author has much to say (p. 206, &c.) of "impartial observation," of being free from scientific prejudice; he would have the "acute and circumspect" observer "indifferent" as to the result of his investigations, so as not to be the interested seeker for certain particular phenomena which he wishes to find.

It is very true that in science, and everywhere, a careful guard should be set against prejudice, that the mind be not warped or blinded by it, and that no previously-formed opinions, or previously-ascertained facts, should be permitted to sway our judgment in its estimate of new phenomena. We must hold our minds ever ready to see the facts as they are, however different they may be from what we expect or desire to find. We must not permit ourselves to be the one-sided advocates of any supposed truth, or fact. But, that we must go forth to observe the phenomena of nature with no ideas previously gained of what we may expect to find, with no supposed truths suggested and rendered probable by previously-observed facts; that we should go forth and pick up facts just as we find them, good, bad and indifferent, without looking for particular facts which we expect to find, and wish to find, as the author's remarks upon this point, and his theory, require us to do, is not true. It is impossible. The human mind can't do it, at least if it has any love for the science it is pursuing. It is undesirable. The mind cannot investigate with zeal and perseverance and success, unless its feelings are warmly enlisted in the object of its investigation. It is unwise. It is not the method pursued by the most eminent men in science.

Professor Agassiz, speaking of discoveries made by observations which have no special object in view, says—"But what can we gain by such discoveries? Very little. Progress in science can be made by such accidental discoveries, but it is not a steady progress. Steady, continuous, and constant progress can be made only by tracing, *with a view*, certain phenomena." And again, "The true method of investigation is to trace serial phenomena, to trace facts one after another in a series

which point at once, by the very series which has been formed by facts, to further facts to which we have to look."

This was the method pursued by Newton in his observations, by means of which, and by his reasoning upon the observed facts, he demonstrated to the world the great truth of gravitation, which he had already arrived at from witnessing the fall of an apple. Was Newton thus impartial and indifferent, when completing that series of *arguments*, rather than observations, by which he demonstrated that the moon is attracted in a certain manner towards the earth as she moves in her orbit? The contrary is too well known to be related.

It was by this method that the great naturalists proceeded who followed out the idea that Goethe and Oken had arrived at, respecting the vertebrated structure of the skull. And as they went on examining skull after skull, did they not expect to find the evidence of this vertebrated structure? Would they not have been disappointed if the facts had proved otherwise?

It is this method Prof. Agassiz is pursuing, in demonstrating his brilliant idea of the classification of the animal kingdom according to embryonic development; an idea, a truth, a principle, that will give new life and a new character to the whole science of zoölogy, if it does not pour some of its vivifying rays upon the kindred sciences. And when he has looked at the embryos of mammals, of birds, of reptiles, to see if the organs of locomotion are webbed in the earliest stages of development, as he expected to find them, has he been indifferent? Has he not found what he *wished* to find? Especially when he looked for the second time to verify what he had before imperfectly seen in the robin's foot. He himself has said, in private conversation, "that the study of science is of great service in enabling a man to *master his passions*; for, when we are pursuing an investigation and look for a certain phenomenon and do not find it, but find that nature conducts herself contrary to what we expected, we are disposed to be *angry* with nature" (this was his word, and it was accompanied by a significant and earnest gesture) "for not doing as we wished her to. But it is of no use, we must submit, and let nature do as she pleases." This is a significant comment upon our author's theory of the right mode of observing facts. It is not by banishing passion from the breast of the scientific observer, but by furnishing him with the means and motives to control it, that he will remove or abate the evils he so justly deplores.

Our whole examination of the subject, up to this point, has been conducted with reference to absolute science, in its strictest sense, consisting

of fundamental principles that are self-evident, of facts that are certainly known by observation or conclusively proved by reasoning, and of those ideas, truths, principles, and doctrines of science, that are also known with absolute certainty, being most fully proved.

But what is to be done with the hosts of facts that are but partially known? and with the many truths in the highest degree probable but not yet fully proved? They certainly constitute no small part of science, and of medical science in particular, where observation is attended with so many difficulties and uncertainties, and we are obliged to be so cautious how we reason from our observations. Are they all to be banished utterly? According to our author's theory, they must be. But they certainly form no small portion of science as it is commonly understood. Some, very many of them, are in the highest degree probable, almost certain; and others are known and proved with various degrees of probability. They certainly ought to have, they do have, their proper place in science: and medical science, at least in some of its departments, would be in a pitiable plight without them. But they must keep their proper place, till such time as they can take a higher stand, and they must even bear upon their foreheads the mark of their inferior condition, till they can be emancipated from their uncertain state, and take their stand among the certainties of science.

Again, there are theories more or less probable, there are hypotheses more or less rational. All these are to be allowed their due importance. They have done a great deal for science, and have still much more to do. She cannot easily get along without them; but their true character must always be kept in view, and they must be dealt with and used accordingly. While they remain theories and hypotheses, they are not to be admitted "in full and regular standing" into absolute science. They are to be "used, as not abusing them."

Dr. Bartlett has in one place alluded to the imperfection of science. It is necessarily imperfect. Such, human science must ever be. There is imperfection in the mind itself; its intellectual powers are limited; its moral proportions are deranged; and hence its very observations are imperfect; its reasonings are imperfect. But it is believed that most of the evils which our author deplores and would remove from science by banishing reasoning and its products and making science to consist of mere phenomena, are not owing, as he supposes, to mere "gratuitous assumption" and "hypothesis"; that they are not theories which have been coined in the secret chambers of the mind, and speculations which it has wrought out from the creations of its own fancy. This might be said of much of the philosophy of the dark ages, when Aristotle (and

not Plato, as Dr. Bartlett, p. 223, erroneously* supposes) reigned in the schools. But it cannot be said of the false notions which have more recently infested medical science. The source of these errors is generally in imperfect observation. They arise, as errors usually arise, not so much from bad reasoning as from bad premises. It is the observations that are generally at fault in medicine. In this science, observation is peculiarly difficult. The phenomena, their relations, the true causes, the actual effects, are so various and so complicated and often so exceedingly difficult to ascertain with accuracy, that a sound judgment and peculiar discrimination are required in the observer. It is owing to a deficiency *here*—to a want of sound judgment and clear discrimination in the observation of facts, rather than to any waywardness of intellect in reasoning from them—that so much trash, so much error, so much folly, so much false doctrine, has crept into medical science and surrounded it with so many absurd theories that would rival its claims. The ridiculous errors of the homœopathists result mainly from their miserable observations. The materia medica of Hahnemann is not so much a book of false theories, it is made up (if I mistake not) almost wholly of the details of observations; but *what* observations! It is in this way that errors find their way into science, and round about it, and gain currency. The very nostrums that are advertised in our newspapers and vended in our drug-shops gain currency by their pretended cures. If any false theory is attached to them, it is merely to satisfy the demand of the mind for something that is rational; the main reliance of those interested in their sale is upon the thousand cures, each duly certified, which they can report. It is only a twelve-month since a Thomsonian professor of an Ohio university, in a lecture in this city, stated that he should report the details of some 150 successive cases of typhoid fever, all *cured* by the power of lobelia and Cayenne pepper! This is *observation* with a vengeance. It is upon observation, such as it is, that most of these follies rest. Here is the real difficulty. And the only remedy for it is to be found in a sound judgment and clear discrimination in the observer, which will direct his eye to the right facts, and enable him to perceive their real value. It is undoubtedly this that gives Louis his eminence as an observer, more than any "system of observation," or any disuse of his reasoning faculties. But men *will* observe badly, in spite of all Dr. Bartlett or any one else can do. There are intrinsic difficulties and obstacles in the case, and there are incapacities in the minds of the observers, which he cannot remove. And a great portion of the

* The philosophy of Plato has been revived only within a few years. It was the Aristotelian philosophy as it existed in the schools that Bacon demolished.

evil must be submitted to. In this as well as in many other respects, we must submit to the necessity—doubtless a wise arrangement of our Creator—of living for the present in an imperfect world. But it is well to know the real seat of the difficulty, if only to avoid any fruitless efforts to remove it. At all events, these defective observations, and the false theories and doctrines deduced from them, cannot be prevented, cannot be removed, by banishing reasoning and its processes and results from science. To do this is to swing madly a two-edged sword, which hews down friend as well as foe. It is to blow up the ship with all that is in it, to prevent it from falling into the hands of the enemy. Or, to use our author's own motto, He "trusts he has got hold of his pitcher by the right handle"; but it is to be feared he has got hold of a handle too low, too near the bottom; and by his bold and vigorous grasp of this *wrong* handle, he has upset it, and spilled out the *higher* and more precious portion of its contents, containing all the *active principles*, which had been extracted from the remaining portion, and has left only the inert and worthless dregs.

Dr. Bartlett's object is a noble one, and he has advanced many noble sentiments and important truths in his book. It is true that science must stick close to facts; it is true that its laws and principles are not powers and agencies lying back of facts; it is true that nature must be studied, and interrogated and investigated in her own broad fields, and not within the four walls of the study; it is true, that there are some facts which cannot be proved by some others, and that each department of science and each class of facts requires its own special observations; it is true that reason alone cannot do everything in science; it is true that false doctrines, gratuitous assumptions, and fanciful theories and hypotheses, must be banished from science; it is true that its facts and truths must be known and proved. And in maintaining these truths and contending against these errors, we will join him with the whole heart and soul. He has, in the main, taken the right side in the contest, but he has chosen his ground most unfortunately. Fighting in a noble cause, which must, of itself, secure final victory to its champions; bringing into the field the finest array of chosen troops, and provided with all the materiel necessary to successful warfare, he has chosen to give battle upon ground on which he cannot gain the victory, and from which he must eventually be driven. He has only been able to display his strength and show on which standard victory must finally rest. He has planted his artillery in a position where it is exposed to a raking and destructive fire, while it is unable to play with effect upon the weak points of the fortress of error he would level with the ground.

Or (if we look at it, not with reference to the errors he has failed to demolish, but with reference to the science he has unintentionally annihilated by a false theory, so far as a false theory can be said to do this), in his effort to drive from the Temple of Science the ridiculous theories, absurd hypotheses, and false doctrines, which have desecrated its altars, he not only drives away those rational hypotheses which have ever been allowed to occupy a humble place near its entrance, to introduce those who are entitled to admission, till they themselves, perhaps, may be allowed to enter with honor; but he removes from it every fact however well-known, or proved, if it has not come under the eye of the observer; and above all, he does not allow a single niche to remain for any of the sublimest truths and soundest principles that have ever received the homage of the worshippers; he leaves nothing but the bare walls around which is arrayed a collection of phenomena. The temple is transformed into a mere cabinet of phenomena. The collection may be large and full and extend to every department of science, and may be most perfectly classified in all its various relations. But that is all. There they lie upon the shelves, a lifeless collection of mere phenomena; the ideas, the truths, the principles, to which they point, and which give them all their life, significance and power, are gone. It is a *Temple* no more; and the Divinity is gone, unable any longer to dwell in it.